APPEAL BRIEF

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TABLE OF CONTENTS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants:	Assaf Govari et al.	**Docket:**	23294
Serial No.:	10/629,660	**Examiner:**	John Fernando Ramirez
Filed:	July 29, 2003	**Art Unit:**	3737
For:	ENERGY TRANSFER AMPLIFICATION FOR INTRABODY DEVICES	**Dated:**	February 23, 2009
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APPEAL BRIEF

Sir:

Pursuant to 35 U.S.C. § 134 and 37 C.F.R. § 41.37, entry of this Appeal Brief in support of the Notice of Appeal filed December 26, 2008 in the above-identified matter is respectfully requested. This paper is submitted as a brief setting forth the authorities and arguments upon which Appellants rely in support of the appeal from the July 25, 2008 Final Rejection of Claims 6-10, 12-15, 17, 19, and 25-32 in the above-identified patent application.

I. REAL PARTY IN INTEREST

The real party of interest in the above-identified patent application is Biosense, Webster, Inc.

II. RELATED APPEALS AND INTERFERENCES

There are no pending appeals or interferences related to this application to Appellants' knowledge.

III. STATUS OF CLAIMS

Claims 6-10, 12-15, 17, 19, and 25-32 are pending. Claims 1-5 and 33-45 were withdrawn from consideration in response to the Restriction Requirement of August 22, 2006. Further, claims 11, 16, 18, 20, and 21-24 were cancelled in the Amendment filed on May 23, 2007.

Of the pending claims, claims 6, 13, 15, 19, and 25 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent 6,366,817 issued to Kung (hereinafter "Kung"), in view of PCT Patent Publication WO 96/05768 to Ben-Haim et al. (hereinafter "Ben-Haim").

Of the pending claims, claims 7-10, 12, 14, 17, and 26-32 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Kung in view of Ben-Haim, further in view of U.S. Patent 6,206,835 issued to Spillman, Jr. et al. (hereinafter "Spillman"), U.S. Patent 6,216,026 issued to Kuhn et al. (hereinafter "Kuhn"), and in view of U.S. Patent 7,001,346 issued to White (hereinafter "White"), and U.S. Patent 5,755,748 issued to Borza (hereinafter "Borza").

Claims 6-10, 12-15, 17, 19, and 25-32 are appealed; a clean copy of these claims is attached hereto in the Claims Appendix.

IV. STATUS OF AMENDMENTS

A Response under 37 C.F.R. §1.116 was filed on October 27, 2008, responsive to the Final Rejection of July 25, 2008. No amendments to the claims were made. An Advisory Action was subsequently issued on December 1, 2008.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Claims 6-10, 12-15, 17, 19, and 25-32 are the claims on appeal. A copy of the rejected claims is attached hereto in the Claims Appendix.

Independent claim 6 recites an apparatus for use in an invasive medical procedure such as placing sensors, implants, tubes, catheters, and treatment devices within a patient's body (See, e.g. paragraph 2, Background).

The apparatus comprises a wireless position sensor which is adapted to be inserted into a body of a subject (See, e.g. FIG. 1, element 20, described in paragraphs 68, 71, and FIGS. 3 and 4, position sensors 140, 142, described in paragraph 78)

the position sensor comprising a power circuit (See, e.g. FIG. 1, elements 22, 24, 28, described in paragraphs 66-68)

which is adapted to be driven inductively by a radio-frequency (RF) electromagnetic field so as to provide operating energy to the position sensor (See, e.g. FIG. 1 element 34, described in paragraphs 65, 71, 72);

a power transmitter, which is adapted to generate the RF electromagnetic field in a vicinity of the body (See, e.g. FIG. 1, elements 52, 34, described in paragraphs 65-67, 72, and FIG. 2 element 152, described in paragraphs 79-80); and

a passive energy transfer amplifier (See, e.g. FIG. 1, element 40, described in paragraphs 65-67, 73, 80, 85), which is adapted to be placed in proximity to the position sensor so as to enhance inductive driving of the power circuit of the wireless position sensor by the RF electromagnetic field (See, e.g. paragraph 80),

the position sensor transmitting signals for determining six position and orientation coordinates of the position sensor (See, e.g. FIG. 2, elements 140, 142, described in paragraph 87); and

a signal processing unit for receiving signals from the position sensor and determining six position and orientation coordinates of the position sensor (See, e.g. FIG. 1, element 54, described in paragraphs 71, 74).

Claim 7 recites the apparatus according to claim 6, wherein the power transmitter is adapted to generate the RF electromagnetic field at a predetermined frequency (See, e.g. FIG. 1, elements 52, 34, described in paragraphs 65-66), and wherein the passive energy transfer amplifier has a resonant response at the predetermined frequency (See, e.g. FIG. 1 element 40, described in paragraph 66).

Claim 8 recites the apparatus according to claim 7, wherein the passive energy transfer amplifier comprises a coil and a capacitance, which are coupled so as to define a resonant circuit having the resonant response at the predetermined frequency (See, e.g. FIG. 1, elements 40, 30, 32, described in paragraphs 65-66).

Claim 9 recites the apparatus according to claim 6, wherein the passive energy transfer amplifier is adapted to be implanted in the body in proximity to the wireless position sensor (See, e.g. FIGS. 1 and 2, element 40, described in paragraph 73).

Claim10 recites the apparatus according to claim 9, wherein the wireless position sensor is for use in association with an orthopedic implant (See, e.g. FIGS. 1 and 2, elements 20, described in paragraphs 69-74), and wherein the passive energy transfer amplifier is incorporated in the orthopedic implant (See, e.g. FIGS. 1 and 2, element 40, described in paragraph 73-74).

Claim 12 recites the apparatus according to claim 10, wherein the implant is a hip joint implant, including a femur head element and an acetabulum element (See, e.g. FIG. 2 elements 60, 62, described in paragraphs 69-70), and wherein the passive energy transfer amplifier comprises a coil, which is integrated in the acetabulum element (See, e.g. FIG. 1 element 30, FIG. 2, element 40, described in paragraphs 70, 73).

Claim 13 recites the apparatus according to claim 6, wherein the passive energy transfer amplifier is adapted to be fixed externally to the body in proximity to an area of the body into which the wireless position sensor is inserted (See, e.g. FIGS. 3 and 4, elements 40, 140, 142, described in paragraphs 76, 80).

Claim 14 recites the apparatus according to claim 13, wherein the wireless position sensor is fixed to an invasive probe for insertion into a heart of the subject (See, e.g. FIG. 3, elements 130, 140, 142, described in paragraph 79), and wherein the passive energy transfer amplifier is adapted to be fixed to a chest of the subject (See, e.g. FIG. 3, element 40, paragraph 80).

Claim 15 recites the apparatus according to claim 14, wherein the wireless position sensor is adapted to provide an indication of location of the probe within the heart (See, e.g. paragraph 79).

Claim 17 recites the apparatus according to claim 6, wherein the power circuit of the wireless position sensor comprises a coil antenna for receiving the electromagnetic field, and

wherein the signal transmitter is coupled to transmit the signal via the coil antenna (See, e.g. FIG. 1, element 26, FIG. 2, element 52, described in paragraphs 67, 71).

Claim 19 recites the apparatus according to claim 6, wherein the position sensor comprises a sensor coil, and wherein the apparatus further comprises one or more field generators, which are adapted to generate energy fields in a vicinity of the medical device, which cause currents to flow in the sensor coil responsively to the position and orientation coordinates of the wireless position sensor (See, e.g. FIG. 2, element 50, described in paragraph 71, FIG. 3, element 128, described in paragraph 79, 82-87).

Independent claim 25 recites an apparatus for use in an invasive medical procedure, comprising:

a wireless position sensor, which is adapted to be inserted into a body of a subject (See, e.g. FIG. 1, element 20, described in paragraphs 68, 71, and FIGS. 3 and 4, position sensors 140, 142, described in paragraph 78),

the device comprising a power circuit, which is adapted to be driven inductively by a radio-frequency (RF) electromagnetic field generated by a power transmitter outside the body, so as to provide operating energy to the wireless position sensor (See, e.g. FIG. 1, elements 22, 24, 28, 34, described in paragraphs 65-68, 71-72);

and a passive energy transfer amplifier, which is adapted to be placed in proximity to the wireless position sensor so as to enhance inductive driving of the power circuit of the wireless position sensor by the RF electromagnetic field, the wireless position sensor transmitting signals for determining six position and orientation coordinates of the position sensor (See, e.g. FIG. 1, element 40, described in paragraphs 65-67, 73, 80, 85); and

a signal processing unit for receiving signals from the position sensor and determining six position and orientation coordinates of the position sensor (See, e.g. FIG. 1, element 54, described in paragraphs 71, 74).

Independent claim 26 recites an orthopedic implant, comprising a prosthetic joint comprising first and second joint elements, which are adapted to be implanted in a body of a subject (See, e.g. FIG. 2 elements 60, 62, described in paragraphs 69-70);

first and second wireless position sensors, which are respectively fixed to the first and second joint elements so as to transmit position signals indicative of an alignment of the first and second joint elements (See, e.g. FIG. 1, element 20, FIG. 2 elements 60, 62, described in paragraphs 69-70), each of the position sensors comprising a power circuit, which is adapted to be driven inductively by a radio-frequency (RF) electromagnetic field so as to provide operating energy to the sensors (See, e.g. paragraph 71);

a power transmitter, which is adapted to generate the RF electromagnetic field in a vicinity of the body (See, e.g. FIG. 2, element 52, paragraph 71); and

a passive energy transfer amplifier, which is fixed to at least one of the first and second joint elements so as to enhance inductive driving of the power circuit of the wireless position sensors by the RF electromagnetic field (See, e.g. FIG. 1 element 30, FIG. 2, element 40, described in paragraphs 70, 73); and

a signal processing unit for receiving the position signals and determining six position and orientation coordinates for the first and second wireless position sensor (See, e.g. FIG. 2, element 54, paragraph 71).

Claim 27 recites the implant according to claim 26, wherein the prosthetic joint comprises a hip joint, and wherein the first and second joint elements comprise a femur head element and an acetabulum element, and wherein the passive energy transfer amplifier is fixed to the acetabulum element (See, e.g. FIG. 2, elements 69, 62, described in paragraphs 69-70, 73).

Claim 28 recites the implant according to claim 26, wherein the prosthetic joint comprises a knee joint (See, e.g. paragraph 74).

Independent claim 29 recites an invasive medical apparatus, comprising a catheter, having a distal end, which is adapted to be inserted into a heart of a subject, the catheter comprising a wireless position sensor, fixed adjacent to the distal end of the catheter so as to transmit position signals indicative of a position of the catheter within the heart, the position sensor comprising a power circuit, which is adapted to be driven inductively by a radio-frequency (RF) electromagnetic field so as to provide operating energy to the position sensor (See, e.g. FIGS. 3 and 4, elements 130, 140, 144, FIG. 1, element 24, described in paragraphs 76-79);

a power transmitter, which is adapted to generate the RF electromagnetic field in a vicinity of the body (See, e.g. FIG. 3, element 152, paragraph 79); and

a passive energy transfer amplifier, which is adapted to be placed in a vicinity of the heart so as to enhance inductive driving of the power circuit of the wireless position sensors by the RF electromagnetic field (See, e.g. FIG. 3 element 40, described in paragraph 80); and

a signal processing unit for receiving the position signals and determining six position and orientation coordinates for the wireless position sensor (See, e.g. FIG. 3, element 134, described in paragraphs 85, 90).

Claim 30 recites the apparatus according to claim 29, wherein the passive energy transfer amplifier is adapted to be placed on a chest of the subject adjacent to the heart (See, e.g. FIG. 3 element 40, described in paragraph 80).

Claim 31 recites the apparatus according to claim 29, wherein the wireless position sensor comprises a sensor coil, and wherein the apparatus further comprises one or more field generators, which are adapted to generate energy fields in a vicinity of the heart, wherein the energy fields cause currents to flow in the sensor coil responsively to the position coordinates of the medical device (See, e.g. FIG. 2, element 50, described in paragraph 71, FIG. 3, element 128, described in paragraph 79, 82-87).

Claim 32 recites the apparatus according to claim 29, wherein the catheter further comprises one or more electrodes for sensing electrical activity within the heart (See, e.g. FIG. 4, elements 146, 148, described in paragraphs 76-77 and 90-91).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 6, 13, 15, 19, and 25 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Kung in view of Ben-Haim.

Claims 7-10, 12, 14, 17, and 26-32 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Kung in view of Ben-Haim, further in view of Spillman, Kuhn, White, and Borza.

VII. ARGUMENT

(A) Examiner's Rejection Of Claims 6, 13, 15, 19, and 25 Is Not Proper.

(I) The hypothetical combination of Kung and Ben-Haim does not disclose an energy transfer amplifier that enhances inductive driving of the power circuit of the wireless position sensor, as recited in independent claims 6 and 25.

Appellants submit that the hypothetical combination of Kung and Ben-Haim does not disclose a passive energy transfer amplifier, which enhances inductive driving of the power circuit of the wireless position sensor by the RF electromagnetic field, as recited in the independent claims. Further, Kung does not provide a proficient suggestion of such an amplifier.

Appellants submit that the Examiner has failed to establish a *prima facie* case of obviousness with respect to Claims 6 and 25 pursuant to 35 U.S.C. § 103(a). To establish a *prima facie* case of obviousness under §103, the Examiner must show that the prior art references teach or suggest all of the claim limitations. The hypothetical combination of Kung and Ben-Haim fails to teach or suggest all of the above-identified limitations for at least the following reasons.

Appellants' claim 6 recites an apparatus for use in an invasive medical procedure, comprising, *inter alia*, a passive energy transfer amplifier, which is adapted to be placed in proximity to the position sensor so as to enhance inductive driving of the power circuit of the wireless position sensor by the RF electromagnetic field. Claim 25 recites a similar apparatus. The enhanced inductive driving is achieved by incorporating within the amplifier a wire loop having a diameter substantially larger than that of the power coil within the position sensor. *See*, for instance, the instant application, paragraphs 65 and 66. Notably, paragraph 66 states that "...(the) large size of coil 30 has been shown to increase the current in power coil 22 by at least

20 times, in experiments carried out by the inventor. Thus, the power available to drive sensor 20 is significantly increased." This provides support for the "passive energy transfer amplifier" recited in independent claims 6 and 25.

In contrast, Kung discloses an electromagnetic field source (EFS) for providing electromagnetic energy to a secondary coil as shown in FIG. 2, reference character No. 230 (see Kung, col. 9 lines 30-40, col. 10, lines 6-22). Kung's specification describes secondary coil 230 as being " . . . activated when located on any region 640 due to [the] orthogonal intersection with the vertically-oriented magnetic fields generated by primary coils" (Col. 10, lines 11-15). "Activated" is defined as "sufficient to induce an operative current in secondary coil 230" (Col. 10, lines 15-18). In other words, if Kung's secondary coil is not in an "orthogonal intersection with the vertically-oriented magnetic fields" its primary coil does not induce a current to flow in the secondary coil (Col. 9, lines 36-40). Accordingly, one of ordinary skill in the art would not be motivated to combine the cited references since a current is only induced in one orientation and the primary coil would not be able to power a secondary coil in any other orientation.

Additionally, Applicants submit that Kung's secondary coil is merely a coil for receiving electromagnetic energy from one or more primary coils and does not suggest or teach amplifying the magnitude of the received electromagnetic energy and therefore does not enhance inductive driving of the power circuit of the wireless position sensor by the RF electromagnetic field. Hence, Kung's secondary coil 230 is not an energy transfer amplifier, as recited in independent Claims 6 and 25. The Examiner erroneously characterizes Kung's secondary coil as an "amplifier" yet Kung's secondary coil does not amplify but instead is directly reliant on the orientation of its primary coil to induce a current flow in its secondary coil. Moreover, the Examiner further mischaracterizes Kung's secondary coil as a energy transfer amplifier which

"enhance[s] inductive driving of the power circuit" by relying on the fact that Kung's secondary coil can somehow be employed in a current detector circuit in another embodiment (Col. 21, lines 2-17). Applicants submit that Kung's disclosure at Col. 21, lines 2-17 (or elsewhere in Kung's specification) lacks any support for the Office Action's erroneous characterization of Kung's secondary coil as an energy transfer amplifier which enhances inductive driving of the power circuit of the wireless position sensor by the RF electromagnetic field as recited in Claims 6 and 25.

Further, Ben-Haim discloses a locating system for determining the location and orientation of an invasive medical instrument, whereby an externally-applied RF field induces a current in three coils located within the invasive medical instrument (Page 15, lines 2-23). Ben-Haim does not disclose or suggest an energy transfer amplifier.

Thus, the hypothetical combination of Kung and Ben-Haim fails to suggest or teach an energy transfer amplifier as recited in both independent Claims 6 and 25. Accordingly, Applicants respectfully request withdrawal of this ground of rejection.

(II) Claims 13, 15, and 19 are patentable based upon dependency from independent claim 6.

Appellants respectfully submit that Claims 13, 15, and 19 are patentable over the cited prior art based upon at least the analysis provided above. Specifically, the hypothetical combination of Kung and Ben-Haim fails to teach, suggest, or render obvious each and every limitation of independent claim 6, from which claims 13, 15, and 19 depend, respectively.

Accordingly, withdrawal of the rejection to the dependent claims 13, 15, and 19 is respectfully requested.

(B) Examiner's Rejection Of Claims of Claims 7-10, 12, 14, 17, and 26-32 Is Not Proper.

(I) The hypothetical combination of Kung and Ben-Haim in view of Spillman, Kuhn, White, and Borza does not disclose an energy transfer amplifier that enhances inductive driving of the power circuit of the wireless position sensor, as recited in Independent Claims 26 and 29.

As mentioned above, Kung and Ben-Haim fail to suggest or teach an orthopedic implant or invasive medical apparatus, comprising, *inter alia*, a passive energy transfer amplifier . . . to enhance inductive driving of the power circuit of the wireless position sensors by the RF electromagnetic field as recited in independent claims 6 and 25. Applicants further submit that Spillman, Kuhn, White and Borza do not overcome the deficiencies of Kung and Ben-Haim described above with respect to Claims 26 and 29.

Spillman discloses an implant device that includes an integral, electrically-passive sensing circuit, communicating with an external interrogation circuit where the sensing circuit includes an inductive element and has a frequency-dependent variable impedance loading effect on the interrogation circuit, varying in relation to the sensed parameter (Spillman, col. 2, lines 13-28). In particular, as seen in Spillman's FIG. 3, an amplifier 72 is directly coupled to resistor 56 and is employed for signal conditioning the voltage developed across resistor 56 not to enhance inductive driving of the power circuit of the wireless position sensor by the RF electromagnetic field (col. 6, lines 21-28). Hence, Spillman fails to suggest or teach an energy transfer amplifier as recited in the independent claims.

Kuhn discloses a method of navigating a magnetic object within an object that is exposed to a magnetic field (Kuhn, col 2, lines 51-65). Nowhere in Kuhn's specification is an

energy transfer amplifier disclosed. Accordingly, Kuhn fails to suggest or teach an energy transfer amplifier as recited in the independent claims.

White discloses an apparatus for making intraoperative orthopedic measurements (White, col. 5, lines 17-19). As shown in White's FIG. 2, two electromagnetic receivers 16 and 18 are placed in a patient to aid in aligning a femur 44 and a pelvis 40 (Col. 6, lines 41-46). Nowhere in White's specification is an energy transfer amplifier disclosed. Accordingly, White fails to suggest or teach an energy transfer amplifier as recited in the independent claims.

Borza discloses a transcutaneous energy transfer device which asserts that varying the spacing between coils in the device results in energy transfer efficiency changes (Borza, col. 2, lines 15-27). Nowhere in Borza's specification is an energy transfer amplifier disclosed. Accordingly, Borza fails to suggest or teach an energy transfer amplifier as recited in the independent claims.

Thus, the hypothetical combination of Kung, Ben-Haim, Spillman, Kuhn, White, and Borza, fails to suggest or teach an energy transfer amplifier as recited in independent claims 26 and 29. Accordingly, Applicants respectfully request withdrawal of this ground of rejection.

(II) Claims 7-10, 12, 14, 17, 27-28, and 30-32 are patentable based upon dependency from independent claims 6, 26, and 29, respectively.

Appellants respectfully submit that Claims 7-10, 12, 14, 17, 27-28 are patentable over the cited prior art based upon at least the analysis provided above. Specifically, the hypothetical combination of Kung, Ben-Haim, Spillman, Kuhn, White, and Borza, fails to teach, suggest, or render obvious each and every limitation of independent claims 6, 26, and 29, from which claims 7-10, 12, 14, 17, 27-28, and 30-32 depend, respectively.

Accordingly, withdrawal of the rejection to the dependent claims 7-10, 12, 14, 17, 27-28, and 30-32 is respectfully requested.

(C) Conclusion

Based on the above arguments and remarks, Appellants respectfully submit that the claims of the instant invention on appeal are not rendered obvious by the hypothetical combination of Kung and Ben-Haim, standing alone, or in combination with any of the cited references. Consequently, the rejection of the claims based on these combinations of references is in error. In view of the remarks submitted hereinabove, the references applied against Claims 6-10, 12-15, 17, 19, and 25-32 on appeal do not render the claims unpatentable under 35 U.S.C. § 103(a). Thus, Appellants submit that the §103(a) rejections are in error and must be reversed.

The Commissioner is hereby authorized to charge any additional fees or credit any overpayment in connection herewith to Deposit Account No. 19-1013/SSMP.

Respectfully submitted,

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VIII. <u>CLAIMS APPENDIX</u>

6. (Rejected) Apparatus for use in an invasive medical procedure, comprising:

a wireless position sensor, which is adapted to be inserted into a body of a subject, the position sensor comprising a power circuit, which is adapted to be driven inductively by a radio-frequency (RF) electromagnetic field so as to provide operating energy to the position sensor;

a power transmitter, which is adapted to generate the RF electromagnetic field in a vicinity of the body; and

a passive energy transfer amplifier, which is adapted to be placed in proximity to the position sensor so as to enhance inductive driving of the power circuit of the wireless position sensor by the RF electromagnetic field, the position sensor transmitting signals for determining six position and orientation coordinates of the position sensor; and

a signal processing unit for receiving signals from the position sensor and determining six position and orientation coordinates of the position sensor.

7. (Rejected) The apparatus according to claim 6, wherein the power transmitter is adapted to generate the RF electromagnetic field at a predetermined frequency, and wherein the passive energy transfer amplifier has a resonant response at the predetermined frequency.

8. (Rejected) The apparatus according to claim 7, wherein the passive energy transfer amplifier comprises a coil and a capacitance, which are coupled so as to define a resonant circuit having the resonant response at the predetermined frequency.

9. (Rejected) The apparatus according to claim 6, wherein the passive energy transfer amplifier is adapted to be implanted in the body in proximity to the wireless position sensor.

10. (Rejected)The apparatus according to claim 9, wherein the wireless position sensor is for use in association with an orthopedic implant, and wherein the passive energy transfer amplifier is incorporated in the orthopedic implant.

12. (Rejected)The apparatus according to claim 10, wherein the implant is a hip joint implant, including a femur head element and an acetabulum element, and wherein the passive energy transfer amplifier comprises a coil, which is integrated in the acetabulum element.

13. (Rejected)The apparatus according to claim 6, wherein the passive energy transfer amplifier is adapted to be fixed externally to the body in proximity to an area of the body into which the wireless position sensor is inserted.

14. (Rejected)The apparatus according to claim 13, wherein the wireless position sensor is fixed to an invasive probe for insertion into a heart of the subject, and wherein the passive energy transfer amplifier is adapted to be fixed to a chest of the subject.

15. (Rejected) The apparatus according to claim 14, wherein the wireless position sensor is adapted to provide an indication of location of the probe within the heart.

17. (Rejected)The apparatus according to claim 6, wherein the power circuit of the wireless

position sensor comprises a coil antenna for receiving the electromagnetic field, and wherein the signal transmitter is coupled to transmit the signal via the coil antenna.

19. (Rejected) The apparatus according to claim 6, wherein the position sensor comprises a sensor coil, and wherein the apparatus further comprises one or more field generators, which are adapted to generate energy fields in a vicinity of the medical device, which cause currents to flow in the sensor coil responsively to the position and orientation coordinates of the wireless position sensor.

25. (Rejected) Apparatus for use in an invasive medical procedure, comprising:

a wireless position sensor, which is adapted to be inserted into a body of a subject, the device comprising a power circuit, which is adapted to be driven inductively by a radio-frequency (RF) electromagnetic field generated by a power transmitter outside the body, so as to provide operating energy to the wireless position sensor; and

a passive energy transfer amplifier, which is adapted to be placed in proximity to the wireless position sensor so as to enhance inductive driving of the power circuit of the wireless position sensor by the RF electromagnetic field, the wireless position sensor transmitting signals for determining six position and orientation coordinates of the position sensor; and

a signal processing unit for receiving signals from the position sensor and determining six position and orientation coordinates of the position sensor .

26. (Rejected) An orthopedic implant, comprising:

a prosthetic joint comprising first and second joint elements, which are adapted to be implanted in a body of a subject;

first and second wireless position sensors, which are respectively fixed to the first and second joint elements so as to transmit position signals indicative of an alignment of the first and second joint elements, each of the position sensors comprising a power circuit, which is adapted to be driven inductively by a radio-frequency (RF) electromagnetic field so as to provide operating energy to the sensors;

a power transmitter, which is adapted to generate the RF electromagnetic field in a vicinity of the body; and

a passive energy transfer amplifier, which is fixed to at least one of the first and second joint elements so as to enhance inductive driving of the power circuit of the wireless position sensors by the RF electromagnetic field; and

a signal processing unit for receiving the position signals and determining six position and orientation coordinates for the first and second wireless position sensor.

27. (Rejected)The implant according to claim 26, wherein the prosthetic joint comprises a hip joint, and wherein the first and second joint elements comprise a femur head element and an acetabulum element, and wherein the passive energy transfer amplifier is fixed to the acetabulum element.

28. (Rejected)The implant according to claim 26, wherein the prosthetic joint comprises a knee joint.

29. (Rejected) Invasive medical apparatus, comprising:

a catheter, having a distal end, which is adapted to be inserted into a heart of a subject, the catheter comprising a wireless position sensor, fixed adjacent to the distal end of the catheter so as to transmit position signals indicative of a position of the catheter within the heart, the position sensor comprising a power circuit, which is adapted to be driven inductively by a radio-frequency (RF) electromagnetic field so as to provide operating energy to the position sensor;

a power transmitter, which is adapted to generate the RF electromagnetic field in a vicinity of the body; and

a passive energy transfer amplifier, which is adapted to be placed in a vicinity of the heart so as to enhance inductive driving of the power circuit of the wireless position sensors by the RF electromagnetic field; and

a signal processing unit for receiving the position signals and determining six position and orientation coordinates for the wireless position sensor.

30. (Rejected) The apparatus according to claim 29, wherein the passive energy transfer amplifier is adapted to be placed on a chest of the subject adjacent to the heart.

31. (Rejected) The apparatus according to claim 29, wherein the wireless position sensor comprises a sensor coil, and wherein the apparatus further comprises one or more field generators, which are adapted to generate energy fields in a vicinity of the heart, wherein the energy fields cause currents to flow in the sensor coil responsively to the position coordinates of the medical device.

32. (Rejected) The apparatus according to claim 29, wherein the catheter further comprises one or more electrodes for sensing electrical activity within the heart.

IX. EVIDENCE APPENDIX

None.

X. RELATED PROCEEDINGS APPENDIX

None.